Original Research

Socioeconomic Factors and Health Status Disparities Associated with Difficulty in ADLs and IADLs among Long-Lived Populations in Brazil: A Cross-Sectional Study

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Abstract

Objective: To evaluate the association between socioeconomic factors, health status, and Functional Capacity (FC) in the oldest senior citizens in a metropolis and a poor rural region of Brazil.

Method: Cross-sectional study of 417 seniors aged ≥80 years, data collected through Brazil's *Health, Well-being and Aging* survey. FC assessed by self-reporting of difficulties in Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs). Chi-square tests and multiple logistic regression analyses were performed using "R" statistical software.

Results: Socioeconomic and demographic inequalities in Brazil can influence FC in seniors aged 80 years and older. Comparatively, urban long-lived people had a higher prevalence of difficulties for ADLs and rural ones showed more difficulties for IADLs. Among urban oldest seniors, female gender and lower-income were correlated with difficulties for IADLs. Among rural oldest seniors, female gender, stroke, joint disease, and inadequate weight independently were correlated with difficulties for ADLs, while the number of chronic diseases was associated with difficulties for IADLs.

Conclusion: Financial constraints may favor the development of functional limitations among older seniors in large urban centers. In poor rural areas, inadequate nutritional status and chronic diseases may increase their susceptibility to functional decline.

Keywords

activities of daily living, socioeconomic factors, health status disparities, chronic disease, aging, longevity, cross-sectional study

Introduction

Functional capacity (FC) is defined as the ability of seniors to live independently, to perform tasks and activities that people find necessary or desirable in their lives. It is influenced by multidimensional factors such as age group, number of medications, social activity aspects and perceived health in relation to peers,[1,2] and characterizes healthy aging.[3] FC can be determined by assessing the degree of difficulty an individual has in performing activities of daily living (ADLs) and in performing instrumental activities of daily living (IADLs). ADLs are related to self-care while IADLs are related to social participation.[4] Disability in ADLs was found to be a risk factor of mortality and cognition impairment among Chinese elders, and the increased mortality or cognitive impairment risk of disability in ADLs could be moderated by the variables of well-being, age, or place of residence.[5] The results of a Brazilian study indicated a

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similar risk of death from limitations in ADLs and IADLs, suggesting that any of these domains can be used appropriately to identify the risk of all-cause mortality among older adults. Thus, vulnerable groups of older adults (ie, with functioning limitations) should be monitored by the health system with a view to reducing the risk of avoidable death.[6]

It has been long established internationally that the oldest members of society are largely unnoticed.[7] However, the disproportionate impact of the recent coronavirus pandemic on this population has thrust it into the center of attention. In the United States population, socioeconomic inequalities and ethnicity differences explained 60% of the county-level variation in life expectancy; and, most of the association between socioeconomic and ethnic factors was mediated through behavioral and metabolic risk factors.[8] The 2 Brazilian studies involving people aged 80 or over showed that FC was associated with being a woman, groupage, and a number of medications[9]; and that older age, marital status, having been affected by stroke, heart disease, and diabetes mellitus were associated with disability in ADLs and IADLs.[10] In fact, in Brazil and other emerging countries, little is known about how economic and regional inequalities can influence health status and its association with difficulties in performing ADLs and IADLs. This knowledge may favor health actions and gerontological care aimed at preventing disability and mortality in the oldest-old age group.

In this study, the objectives were (1) to evaluate and compare the association between FC and health status in 2 Brazilian long-lived populations aged 80 years and older; and (2) to examine how different socioeconomic and demographic reality and health conditions influence the functional capacity of the oldest members of these communities. One population lives in one of the poorest regions, Brejo dos Santos (population 6449, population density 68.7/km^2), and another in one of the largest urban centers of Latin America, São Paulo (urban population 12,176,866, urban population density 8005/km^2).

Method

Population and Data

This is a quantitative cross-sectional study conducted with men and women aged 80 years old and older in Brejo dos Santos and São Paulo. Information was collected in seniors' homes through the *Saúde*, *Bem-Estar e Envelhecimento—SABE* (Health, Well-being, and Aging Study) questionnaire,[11,12] administered by trained interviewers. In Brejo dos Santos, data collection occurred in May 2017 and in São Paulo between March and June 2016.

The sample from Brejo dos Santos consisted of 179 seniors aged 80 years and older, out of a total of 188 such residents listed by the Municipal Health Secretariat. Inclusion criteria were: men and women, aged 80 and older, resident in the municipality. Nine of the target cohort did not take part due to refusals, migration to another city, and other reasons (4.9%).

Long-lived people from São Paulo were selected by a representative probabilistic sample of the population aged 60 years and older. A detailed description of the study design and sampling process was previously published.[11,12] For this cross-sectional analysis, the sample was restricted to 238 seniors aged 80 years and older who participated in the fourth cohort.

Outcomes

FC was assessed using 2 outcome variables that were analyzed separately by reporting difficulties in ADLs and IADLs in the Katz[13] and Lawton et al[14] indexes. Questions about ADLs included walking, dressing, bathing, personal hygiene, eating alone, lying down and getting up from bed and chairs, and toilet hygiene. The IADLs were: preparing a hot meal, taking care of their own money, using transportation, shopping, phoning, doing light housework, and taking medicine. Participants were asked if they had difficulty with each activity and could choose to answer: "yes," "no," "can't," or "not usually." Those seniors who answered only "no" or "not usually" were classified as having no difficulties while those who answered "yes" or "can't" for at least 1 of the activities were classed as having difficulties. The variables were created following the pattern of previously published studies.[15]

Covariates

The socioeconomic and demographic factors selected were: gender (women or men); age group (80-89 years and 90 years and older); ethnicity (white and non-white); marital status ("with partner" including married and cohabiting; and "without a partner" for widowed, divorced, separated, and single); literacy ("yes" for seniors who attended school and learned to write and read and "no"); income ($\leq$1 minimum wage and $>$1 minimum wage); income sufficiency (whether they felt that their income was sufficient to cover their expenses); and whether they felt they had had insufficient food up until age 15 (yes/no). Income was assessed according to the lowest possible monetary payment in Brazil, defined by law, that a worker or retiree must receive. The value is valid for every country and is reassessed annually based on the current cost of living of the population (actually R$ 1102.00 or US$ 207.92 per month). People who earn less than this minimum wage are generally informal or self-employed and do not guarantee this right by law while they are workers or are retiring.

Health situation factors were: difficulty of access to health services (yes/no); mammography at some point in life (yes/no); pap smear at some point in life (yes/no); hormone replacement therapy at some point in life (yes/no); prostate examination at some point in life (yes/no); influenza vaccination (yes/no); pneumonia vaccination (yes/no); tetanus and diphtheria vaccine (yes/no); number of chronic diseases—obtained by

reporting hypertension, diabetes, chronic lung disease, heart disease, stroke, joint disease, and cancer (none, 1, 2, or more); stroke (yes/no); joint disease (yes/no); osteoporosis (yes/no); Body Mass Index (BMI) (obtained by the equation BMI = weight [kg]/height [m²]). Weight and height were measured on 3 occasions to increase reliability, and then the average of 3 measurements was obtained. BMI cutoffs adopted were those proposed by the Nutrition Screening Initiative which considers sub-nutrition BMI ≤ 22 kg/m², adequate weight when BMI is between 22 and 27 kg/m² and overweight BMI ≥ 27 kg/m²[16]; and polypharmacy assessed through concomitant use of 5 or more medicines (yes/no).

Statistical Analysis

Data were tabulated in Epidata 3.1 double-entry program. Afterward, they were analyzed using "R" statistical software,[17] using bivariate statistical and multiple logistic regression analyses. Pearson's chi-square test, Fisher's exact test, and the determination of the odds ratio (OR) were used in the bivariate analysis. For multiple logistic regression analysis, an initial logistic regression model was obtained with all variables taken as measures of association of the OR and 95% confidence intervals (95% CI). The adjustment variables that presented $P \leq .20$ in the initial model were included in the final multiple analyzes and in the interpretation of the results. The likelihood ratio test was used to enable quality of fit goodness and $P < .05$ was considered as a statistically significant association. Chi-square and Nagelkerke R^2 tests were used as indicators for model fitness and their results indicated that the adjustments were reasonable. To perform the statistical analysis, 3 databases were used: 1 with the totality of information including both populations and the other 2 databases, referring to each population data separately.

Ethical Considerations

The study conducted in Brejo dos Santos, Paraíba (SABE-PB) received approval from the Ethics Committee for Research on Human of Universidade Estadual da Paraíba under the number 2 067 818. The study conducted in São Paulo (SABE-SP) was submitted to the Ethics Research Committee of Universidade de São Paulo and obtained a favorable assent in all collections under the number 2044. All participants were informed about study objectives and agreed to participate in the survey.

Results

Populations of Brejo dos Santos and São Paulo have distinct socioeconomic and demographic profiles like is presented in Table 1. Thus, it was possible to observe that in Brejo dos Santos, 54.7% of the oldest old were women, with a mean age of 85.5 years (±5.3) ranging from 80 to 102 years. Regarding marital status, 56.9% had no partner and the average income was low as 67% reported receiving up to 1 minimum wage and 62% had no literacy. Among rural long-lived, 46.8% had difficulties with ADLs and 68.7% had difficulties with IADLs. In São Paulo, there was a predominance of women reaching 70.6% of the sample. Age ranged from 80 to 101 years, with an average of 86.8 years (±4.7) and 78.9% of the oldest-old had no partner. Most (58.1%) received income higher than the minimum wage and only 21.3% weren't literate. Among the urban sample, 53.2% had difficulties with ADLs and 61.6% had difficulties with IADLs (Table 1).

The association between difficulties for ADLs and IADLs with the geographic origin of each long-lived population (rural and urban areas) was shown in Table 2, considering the results of Pearson's chi-square test. In fact, there was a significant difference for difficulties in ADLs in dressing, own money management, and phoning between the 2 populations. Regarding IADLs, there was statistical significance for the use of transport and shopping. In rural areas of Brazil, the oldest-old people need help to realize shopping, to go to the bank, and they barely use the telephone or mobile; because they usually live in farms far from the center of the cities.

Table 3 shows the results of the bivariate analysis for each population separately in relation to difficulties in ADLs and difficulties in IADLs. For both populations, was found an association between difficulty for ADLs and older age and stroke. In Brejo dos Santos, having difficulty in at least 1 of ADLs was associated with female gender, having no partner, food insufficiency until 15 years old, joint disease, and BMI. In São Paulo, however, there was an association with no literacy, income lower than minimum wage, osteoporosis, and polypharmacy.

Regarding difficulties in IADLs, it was observed that, in the urban long-lived sample, there was a significant difference for a larger number of variables analyzed (Table 3). However, in relation to economic aspects, the fact that most rural long-lived have only 1 minimum wage retirement and are relatively satisfied with this income; no association of these socioeconomic and demographic factors with lower functional status was observed, as was the case with the urban long-lived sample. In contrast, in Brejo dos Santos, it was observed an association of difficulty for IADLs with 2 or more chronic diseases and joint disease, aspects not observed in São Paulo.

Supplemental Table 1 shows the association between difficulties for ADLs and IADLs with gender dimensions for each population separately. Women from both populations were more likely to experience difficulties walking, bathing, lying down, and get out of the bed and chairs and toilet hygiene activities. A statistically significant difference for the activities of dressing, preparing a hot meal, and taking care of one's own money was observed only among women in São Paulo.

Table 4 presents the results of the final model of multiple logistic regression analysis in which populations were

Table 1. Descriptive and Bivariate Results Showing the Differences of Demographic Socioeconomic Characteristics, Health Status, and Health Services between the Rural and Urban Long-Lived Populations.

	SABE-PB		SABE-SP		Pearson's test
	Total		Total		
Variables	n	%	n	%	*P*-value
Gender					**.001**
Women	98	54.7	168	70.6	
Men	81	45.3	70	29.4	
Age group					.15
90+	38	21.2	65	27.3	
80-89	141	78.8	173	72.7	
Marital status					**<.001**
No partner	102	56.98	188	78.99	
With partner	77	43.02	50	21.01	
Referred ethnicity					.25
White	91	54.17	140	61.67	
Non-white	77	45.8	87	38.3	
Literacy					**<.001**
No	111	62	49	21.3	
Yes	68	38	181	78.7	
Food insufficiency up to age 15					**<.001**
Yes	67	41.4	33	14.8	
No	95	58.6	190	85.2	
Income					**<.001**
≤1 minimum wage	118	67	88	41.9	
>1 minimum wage	58	33	122	58.1	
Income sufficiency					.06
No	69	39	90	40	
Yes	108	61	135	60	
Number of chronic diseases					**<.001**
One	64	35.8	42	18.8	
Two or more	94	52.5	164	73.5	
None	21	11.7	17	7.6	
Difficulty in access to health services					**.002**
Yes	26	15.3	68	28.7	
No	144	84.7	169	71.3	
Mammography at some point in life					**<.001**
No	76	80	33	20.12	
Yes	19	20	131	70.88	
Pap smear at some point in life					**<.001**
No	65	71.4	26	15.85	
Yes	26	28.6	138	84.15	
Hormone replacement at some point in life					.45
Yes	10	12	24	15.69	
No	73	88	129	84.31	
Prostate examination at some point in life					**<.001**
No	34	42	9	13.23	
Yes	47	58	59	86.76	
Influenza vaccine					.93
No	22	12.6	29	12.29	
Yes	153	87.4	207	87.71	
Vacina para pneumonia					**<.001**
No	159	93	90	44.12	
Yes	12	7	114	55.88	
Tetanus and diphtheria vaccine					**<.001**
No	118	73.3	40	18.87	
Yes	43	26.7	172	81.13	
Stroke					.33
Yes	16	8.9	28	11.9	
No	163	91.1	207	88.1	
Pain					**<.001**
Yes	37	21.3	93	41.9	
No	137	78.7	129	58.1	
Joint disease					.46
Yes	108	60.3	134	56.8	
No	71	39.7	102	43.2	
Osteoporosis					**<.001**
Yes	24	13.5	66	28.7	
No	154	86.5	164	71.3	
BMI					**.01**
Sub nutrition	40	28.2	30	16.4	
Overweight	34	23.9	67	36.6	
Normal weight	68	47.9	86	47	
Polypharmacy					**<.001**
Yes	55	39.3	139	63.5	
`No	85	60.7	80	36.5	
Difficulty in ADLs					.2
Yes	80	46.8	126	53.2	
No	91	53.2	111	46.8	
Difficulty in IADLs					.13
Yes	123	68.7	146	61.6	
No	56	31.3	91	38.4	

Note. Data was collected in Brejo dos Santos, in the state of Paraíba, Brazil (SABE-PB) and in São Paulo, capital (SABE-SP) in 2017 and 2016, respectively.
SABE = health, well-being, and aging; BMI = body mass index; ADLs = activities of daily living; IADLs = instrumental activities of daily living.
Bold indicates $P < .05$.

evaluated separately considering difficulties for ADLs and difficulties for IADLs as outcome variables. The age of 90 years and older was associated with difficulties for ADLs and IADLs in both samples. In the rural community, female gender, stroke, joint disease, and inadequate weight were evidenced as associated factors with difficulties for ADLs, while the number of chronic diseases was associated with difficulties for IADLs. Among the urban sample, being female and earning equal or less than 1 minimum wage worsens FC for IADLs.

Discussion

Both study populations showed differences in the prevalence of difficulties in performing ADLs and IADLs. Comparatively, urban long-lived people had a higher prevalence of difficulties for ADLs and rural ones showed more difficulties for IADLs. One of the factors that prevent functional deficits is social participation.[18] Long-lived people who live in interior municipalities in northeastern Brazil take more walks and are in the habit of going out on the street to talk to neighbors, which makes them more active and more independent.[2] This

Table 2. Pearson's Chi-Square Results Showing the Association between Difficulties for ADLs and IADLs with the Geographic Origin of Each Long-Lived Population (Rural and Urban Areas).

	SABE-PB rural		SABE-SP urban				
	Total		Total				
Difficulties	n	%	n	%	OR crude	CI 95%	*P*
ADLs							
Walking							.12
Yes	19	4.6	38	9.2	0.63	0.35-1.13	
No	159	38.3	199	48	1.0	1.0	
Dressing							**.03**
Yes	70	16.9	68	16.4	1.59	1.05-2.39	
No	109	26.3	168	40.5	1.0	1.0	
Bathing							.84
Yes	50	12	68	16.4	0.96	0.62-1.47	
No	129	31.1	168	40.5	1.0	1.0	
Personal hygiene							.44
Yes	45	10.8	52	12.5	1.19	0.76-1.89	
No	134	32.2	185	44.5	1.0	1.0	
Eating							.83
Yes	20	4.8	28	6.7	0.94	0.51-1.73	
No	159	38.2	209	50.2	1.0	1.0	
Lie down and get out of bad and chairs							.09
Yes	41	10.2	76	18.9	0.7	0.44-1.07	
No	126	31.3	160	39.7	1.0	1.0	
Toilet hygiene							.12
Yes	39	9.5	69	16.8	0.7	0.45-1.11	
No	135	32.8	168	40.9	1.0	1.0	
IADLs							
Hot meal preparation							.44
Yes	39	9.4	59	14.2	0.84	0.53-1.32	
No/don't usually do	140	33.7	177	42.7	1.0	1.0	
Own money management							**.003**
Yes	72	17.3	63	15.1	1.86	1.23-2.81	
No/don't usually do	107	25.7	174	41.8	1.0	1.0	
Use transport							.18
Yes	58	14	91	22	0.76	0.50-1.14	
No/don't usually do	121	29.2	144	34.8	1.0	1.0	
Shopping							.83
Yes	61	14.7	78	18.8	1.05	0.69-1.58	
No/don't usually do	118	28.4	158	38.1	1.0	1.0	
Phoning							**.004**
Yes	26	6.3	62	15	0.48	0.29-0.79	
No/don't usually do	152	36.8	173	41.9	1.0	1.0	
Light housework							.16
Yes	55	13.3	58	14	1.36	0.88-2.11	
No/don't usually do	123	29.8	177	42.9	1.0	1.0	
Taking medicines							.94
Yes	64	15.4	84	20.2	1.01	0.68-1.52	
No/don't take medicine	115	27.6	153	36.8	1.0	1.0	

Note. Data was collected in Brejo dos Santos, in the state of Paraíba, Brazil (SABE-PB) and in São Paulo, capital (SABE-SP) in 2017 and 2016, respectively.
SABE = health, well-being, and aging; OR crude = crude odds ratio; 95% CI = 95% confidence interval; ADLs = activities of daily living; IADLs = instrumental activities of daily living. Bold indicates $P < .05$.

situation may have contributed to a lower prevalence of difficulties for ADLs in Brejo dos Santos. In contrast, in rural communities, the elderly depend more on other people to manage finances, payments, purchases, and use bank branches, given that they may have to travel to neighboring cities to carry out these activities.

Rural women in this study were about 3 times more likely to have difficulties in performing ADLs, while urban women were 3.3 more likely to have difficulties in performing IADLs than men. Female gender was associated with functional limitations, corroborating results in the literature.[2,10,18-20] Women's greater fragility can be explained by the fact that some diseases are more disabling for women while more lethal for men. Functional disability can be considered a risk factor for male mortality[21] and, although men have a shorter life expectancy, those who reach older age are healthier.[22]

In the urban population, the ratio between women and men is approximately 2:1, and in the rural population 1:1. However, this information should be interpreted with caution. There is a significant difference between the frequency of mammography and pap smear among long-lived women from Paraíba and those from São Paulo and between the frequency of prostate examination among men from Brejo dos

Table 3. Bivariate Analysis Showing the Association between Demographic Socioeconomic Variables, Health Situation, and Health Services with Difficulties for ADLs and IADLs in 2 Elderly Populations Separately.

	Difficulties for ADLs						Difficulties for IADLs					
	SABE-PB			SABE-SP			SABE-PB			SABE-SP		
	Yes	No		Yes	No		Yes	No		Yes	No	
Variables	n (%)	n (%)	*P*	n (%)	n (%)	*P*	n (%)	n (%)	*P*	n (%)	n (%)	*P*
Gender			**.001**			.1			**.013**			**<.001**
Women	55 (32.16)	40 (23.39)		95 (40.08)	73 (30.8)		75 (41.9)	23 (12.85)		117 (49.37)	51 (21.52)	
Men	25 (14.62)	51 (29.82)		31 (13.08)	38 (16.03)		48 (26.82)	33 (18.44)		29 (12.24)	40 (16.88)	
Age group			**.004**			**.001**			**.001***			**<.001**
90+	25 (14.62)	12 (7.02)		45 (18.99)	19 (8.02)		34 (18.99)	4 (2.23)		51 (21.52)	13 (5.49)	
80-89	55 (32.16)	79 (46.2)		81 (34.18)	92 (38.82)		89 (49.72)	52 (29.05)		95 (40.08)	78 (32.91)	
Referred ethnicity			.72			.45			.45			.033
White	41 (25.41)	47 (29.19)		68 (30.09)	71 (31.42)		64 (38.1)	27 (16.07)		76 (33.63)	63 (27.88)	
Non-white	32 (19.88)	41 (25.47)		47 (20.80)	40 (17.7)		50 (28.76)	27 (16.07)		60 (26.55)	27 (11.95)	
Marital status			**.01**			.51			.05			**.007**
No partner	53 (30.99)	44 (25.73)		102 (43.04)	86 (36.29)		76 (42.46)	26 (14.53)		124 (52.32)	64 (27)	
With partner	27 (15.79)	47 (27.49)		24 (10.13)	25 (10.55)		47 (26.26)	30 (16.76)		22 (9.28)	27 (11.39)	
Literacy			.55			**.018**			.67			**.014**
No	51 (29.82)	54 (31.58)		33 (14.41)	16 (6.99)		75 (41.9)	36 (20.11)		37 (16.16)	12 (5.24)	
Yes	29 (16.96)	37 (21.64)		87 (37.99)	93 (40.61)		48 (26.82)	20 (11.17)		101 (44.1)	79 (34.5)	
Income			.59			**.02**			.72			**<.001**
≤1 minimum wage	48 (28.4)	66 (39.05)		54 (25.71)	34 (16.19)		77 (43.75)	41 (23.30)		69 (32.86)	19 (9.05)	
>1 minimum wage	31 (18.34)	24 (14.2)		55 (26.19)	67 (31.9)		43 (24.43)	15 (8.52)		59 (28.1)	63 (30)	
Income sufficiency			.34			.1			.47			**.004**
No	33 (19.53)	32 (18.93)		52 (23.11)	38 (16.89)		45 (25.42)	24 (13.56)		64 (28.44)	26 (11.56)	
Yes	45 (26.63)	59 (34.91)		63 (28)	72 (32)		76 (42.94)	32 (18.08)		70 (31.11)	65 (28.89)	
Food insufficiency up to age 15			**.01**			.21			.11			.34
Yes	35 (22.73)	30 (19.48)		20 (8.97)	13 (5.83)		49 (30.25)	18 (11.11)		22 (9.87)	11 (4.93)	
No	31 (20.13)	58 (37.66)		93 (41.7)	97 (43.5)		58 (35.8)	37 (22.84)		110 (49.33)	80 (35.87)	
Difficulty in access to health services			.44			.8			.9			.13
Yes	10 (6.1)	15 (9.15)		37 (15.61)	31 (13.08)		18 (10.59)	8 (4.71)		47 (19.83)	21 (8.86)	
No	67 (40.85)	72 (43.9)		89 (37.55)	80 (33.76)		98 (57.65)	46 (27.06)		99 (41.77)	70 (29.54)	
Mammography at some point in life			.53			.84			.81			.59
No	43 (46.74)	31 (33.7)		19 (11.59)	14 (8.54)		58 (61.05)	18 (18.95)		24 (14.63)	9 (5.49)	
Yes	9 (9.78)	9 (9.78)		73 (44.51)	58 (35.37)		14 (14.74)	5 (5.26)		89 (54.27)	42 (25.61)	
Pap smear at some point in life			**.03**			.8			.14			.96
No	39 (44.32)	23 (26.14)		14 (8.54)	12 (7.32)		52 (57.14)	13 (14.29)		18 (10.98)	8 (4.88)	
Yes	10 (11.36)	16 (18.18)		78 (47.56)	60 (36.59)		17 (18.68)	9 (9.89)		95 (57.93)	43 (26.22)	
Hormone replacement at some point in life			.33			.09			.56			.94
No	40 (49.38)	31 (38.27)		72 (47.06)	57 (37.25)		52 (62.65)	21 (25.3)		87 (56.86)	42 (27.45)	
Yes	4 (4.94)	6 (7.41)		9 (5.88)	15 (9.8)		8 (9.64)	2 (2.41)		16 (10.46)	8 (5.23)	
Prostate examination at some point in life			.06			**.037**			.19			.11
No	15 (19.74)	19 (25)		7 (10.29)	2 (2.94)		23 (28.4)	11 (13.58)		6 (8.82)	3 (4.41)	
Yes	10 (13.16)	32 (42.11)		24 (35.29)	35 (51.47)		25 (30.86)	22 (27.16)		23 (33.82)	36 (52.94)	

(continued)

Table 3. (continued)

	Difficulties for ADLs						Difficulties for IADLs					
	SABE-PB			SABE-SP			SABE-PB			SABE-SP		
	Yes	No		Yes	No		Yes	No		Yes	No	
Variables	n (%)	n (%)	*P*	n (%)	n (%)	*P*	n (%)	n (%)	*P*	n (%)	n (%)	*P*
Influenza vaccine			.39			.34			.59			.94
No	8 (4.79)	13 (7.78)		13 (5.51)	16 (6.78)		14 (8)	8 (4.57)		18 (7.63)	11 (4.66)	
Yes	70 (41.92)	76 (45.51)		112 (47.46)	95 (40.25)		106 (60.57)	47 (26.86)		127 (53.81)	80 (33.9)	
Pneumonia vaccine			.21			.9			.96			**.01**
No	71 (43.56)	81 (49.69)		45 (22.06)	45 (22.06)		107 (62.57)	52 (30.41)		63 (30.88)	27 (13.24)	
Yes	3 (1.84)	8 (4.91)		58 (28.43)	56 (27.45)		8 (4.68)	4 (2.34)		60 (29.41)	54 (26.47)	
Tetanus and diphtheria vaccine			.06			.06			.16			.14
No	57 (37.25)	55 (35.95)		26 (12.26)	14 (6.6)		85 (52.8)	33 (20.5)		28 (13.21)	12 (5.66)	
Yes	14 (9.15)	27 (17.65)		84 (39.62)	88 (41.51)		26 (16.15)	17 (10.56)		99 (46.7)	73 (34.43)	
Number of chronic diseases						**.006**			**.04**			.573
One	25 (14.62)	34 (19.88)		14 (6.31)	28 (12.61)		40 (22.35)	24 (13.41)		24 (10.81)	18 (8.11)	
Two or more	44 (25.73)	47 (27.49)		96 (43.24)	68 (30.63)		72 (40.22)	22 (12.29)		102 (45.95)	62 (27.93)	
None	11 (6.43)	10 (5.85)		6 (2.7)	10 (4.5)		11 (6.15)	10 (5.59)		8 (3.6)	8 (3.6)	
Stroke			**.01**			**.004**			.08			**.045**
Yes	12 (7.02)	4 (2.34)		22 (9.36)	6 (2.55)		14 (7.82)	2 (1.12)		22 (9.36)	6 (2.55)	
No	68 (39.77)	87 (50.88)		102 (43.4)	105 (44.68)		109 (60.89)	54 (30.17)		122 (51.91)	85 (36.17)	
Joint disease			**.02**			.18			**.001**			.32
Yes	56 (32.75)	48 (28.07)		76 (32.2)	55 (23.31)		84 (46.93)	24 (13.41)		86 (36.44)	48 (20.34)	
No	24 (14.04)	43 (25.15)		49 (20.76)	53 (22.46)		39 (21.79)	32 (17.88)		59 (25)	43 (18.22)	
Osteoporosis			.06			**.012**			**.002**			**.034**
Yes	15 (8.82)	8 (4.71)		43 (18.7)	23 (10)		23 (12.92)	1 (0.56)		47 (20.43)	19 (8.26)	
No	65 (38.24)	82 (48.24)		77 (33.48)	87 (37.83)		99 (55.62)	55 (30.9)		92 (40)	72 (31.3)	
Pain			.84			.13			.49			.25
Yes	17 (10.24)	19 (11.45)		52 (23.42)	41 (18.47)		27 (15.52)	10 (5.75)		59 (26.58)	34 (15.32)	
No	59 (35.54)	71 (42.77)		59 (26.58)	70 (31.53)		92 (52.87)	45 (25.86)		72 (32.43)	57 (25.68)	
BMI			**.004**			.09			.326			.96
Sub nutrition	19 (14.18)	20 (14.93)		12 (6.59)	18 (9.89)		29 (20.42)	11 (7.75)		16 (8.79)	14 (7.69)	
Overweight	18 (13.43)	15 (11.19)		36 (19.78)	30 (16.48)		23 (16.20)	11 (7.75)		37 (20.33)	29 (15.93)	
Normal weight	15 (11.19)	47 (35.07)		32 (17.58)	54 (29.67)		40 (28.17)	28 (19.72)		48 (26.37)	38 (20.88)	
Polypharmacy			.45			**.038**			.25			.16
Yes	28 (21.05)	25 (18.80)		81 (36.99)	58 (26.48)		43 (30.71)	12 (8.57)		93 (42.47)	46 (21)	
No	37 (27.82)	43 (32.33)		35 (15.98)	45 (20.55)		59 (42.14)	26 (18.57)		46 (21)	34 (15.53)	

Note. Data was collected in Brejo dos Santos, in the state of Paraíba, Brazil (SABE-PB) and in São Paulo, capital (SABE-SP) in 2017 and 2016, respectively.
SABE = health, well-being and aging; BMI = body mass index; ADLs = activities of daily living; IADLs = instrumental activities of daily living.
Bold indicates $P < .05$.

Table 4. Association between Demographic Socioeconomic Characteristics, Health Situation, and Health Services with Difficulties in ADLs and IADLs for Each Elderly Population Separately.

	Difficulties							
	ADLs				IADLs			
	SABE PB		SABE SP		SABE PB		SABE SP	
Variables	ORadj (CI 95%)	*P*	ORadj (CI 95%)	*P*	ORadj (CI 95%)	*P*	ORadj (CI 95%)	*P*
Gender		**.019**		—		.05		**.003**
Women	2.99 (1.17-7.66)		—		2.37 (0.98-5.72)		3.26 (1.48-7.15)	
Men	1.0		—		1.0		1.0	
Age group		**.008**		**.013**		**<.001**		**<.001**
90+	3.91 (1.38-11.06)		2.83 (1.22-6.54)		8.59 (2.29-32.25)		4.27 (1.84-9.94)	
80-89	1.0		1.0		1.0		1.0	
Referred ethnicity		.561		—		.053		—
White	1.3 (0.54-3.14)		—		2.31 (0.97-5.49)		—	
Non-white	1.0		—		1.0		—	
Marital status		.329		.2		—		.38
No partner	1.62 (0.61-4.28)		1.81 (0.7-4.65)		—		1.44 (0.63-3.32)	
With partner	1.0		1.0		—		1.0	
Income		—		.14		—		**<.001**
≤1 minimum wage	—		1.69 (0.83-3.42)		—		3.34 (1.72-6.49)	
>1 minimum wage	—		1.0		—		1.0	
Stroke		**.02**		—		.06		—
Yes	8.95 (1.23-65.09)		—		6.85 (0.67-69.86)		—	
No	1.0		—		1.0		—	
Joint disease		**.03**		—		.234		—
Yes	4.2 (1.12-15.7)		—		2.22 (0.57-8.63)		—	
No	1.0		—		1.0		—	
Osteoporosis		—		.08		.09		—
Yes	—		2.04 (0.91-4.58)		5.14 (0.57-46.32)		—	
No	—		1.0		1.0		—	
Number of chronic diseases		.073		—		**.038**		—
One	0.94(0.24-3.65)		—		5.29 (1-33.21)		—	
Two or more	0.31(0.08-1.24)		—		4.96 (1.18-20.92)		—	
None	1.0		—		1.0		—	
BMI		**.002**		.12		.184		—
Sub nutrition	4.36 (1.55-12.24)		0.88(0.32-2.38)		2.46 (0.91-6.64)		—	
Overweight	4.98 (1.65-15.07)		1.97(0.94-4.14)		1.17 (0.41-3.34)		—	
Normal weight	1.0		1.0		1.0		—	
Chi-square test	0.18		0.0057		0.1594		0.0576	
Nagelkerke R^2	0.36		0.14		0.32		0.25	

Note. Data was collected in Brejo dos Santos, in the state of Paraíba, Brazil (SABE-PB) and in São Paulo, capital (SABE-SP) in 2017 and 2016, respectively.
SABE = health, well-being and aging; ORadj = adjusted odds ratio; 95% CI = 95% confidence interval; ADLs = activities of daily living; IADLs = instrumental activities of daily living; BMI = body mass index.
Bold indicates $P < .05$ (likelihood rate test).

Santos and those from São Paulo. It is known which tests are important to prevent death from breast cancer,[23,24] cervical cancer,[25] and prostate cancer.[26] Although the frequency of men who already have a prostate exam in Brejo de Santos is below São Paulo, it is still much higher than women who have access to breast and cervical cancer screening in Brejo de Santos. A question for some future studies is whether men from Brejo dos Santos live longer and women die earlier due to the difference in access to these services.

Income was associated with difficulty for IADLs among the urban oldest old. This disagrees with an earlier Brazilian study, which suggested that seniors from rural areas, with low socioeconomic status, were more likely to develop functional decline than those from urban areas, given the latter's higher income and greater access to information. Good economic conditions allow access to quality health information and services, resulting in a healthier life.[18] However, the fact that the population of Brejo dos Santos is more homogeneous and presents practically the same income may have contributed to the non-significant statistical difference.

Oldest-old affected by stroke had more limitations for ADLs, being an independently associated factor among rural long-lived. In a study of Chinese persons aged 80 years and older, stroke was one of the main risk factors for the decline of ADLs and IADLs.[27] After a stroke, seniors may have limiting sequelae and functional recovery in ages over 85 years old may be more difficult and is needed to preserve remaining skills.[28]

The joint disease was associated with difficulties for ADLs among the rural oldest-old. Diagnosis of lower limb osteoarthritis (OA), a joint disease, is related to the ability to perform ADLs and IADLs in seniors since joint degeneration in OA results in pain, which in turn leads to stiffness and movement restriction. Clinical diagnosis of hip or knee OA is associated with difficulties in mobility, self-care ability, and daily activities.[29]

Association between functional decline and chronic diseases is documented in recent research.[19,20,30] In the present study, the rural oldest-old who had 1 chronic disease were 5.3 times more likely to have difficulties for IADLs, while those with 2 or more chronic diseases had 4.9 more chances of having difficulties for IADLs. These values are higher than those found in a study in Poland, where rural seniors with approximately 5 chronic diseases were 1.2 times more likely to have difficulties with IADLs.[30] In a longitudinal study of Chinese seniors aged 80 and older, it was found that multiple comorbidities may lead to disability over time.[27] The number of chronic conditions in seniors aged 80 years and older is associated with limitations for IADLs.[20]

Our samples of oldest-old experienced different realities over the course of their lives, and it is likely that the rural long-lived had access to health services later than their urban counterparts. This could explain the fact that the number of chronic diseases was an independent variable associated with a functional decline only among the rural oldest old, whereas throughout their lives they may have had less access to preventive health actions.

In the Northeast, where Brejo dos Santos is situated, there has been an improvement in health service provision. However, these advances are concentrated in a few cities, since investments and the expansion of economic activities have maintained the historical tendency of concentration in the capitals and traditional centers.[31] Geographical inequalities in the use of health services date before the creation of the National Health System (*Sistema Único de Saúde*—SUS), especially between the Northeast and Southeast regions. Despite the reduction of these inequalities, the region where São Paulo is located, the Southeast, still performs better than the Northeast.[32] However, the present study did not find a positive association between difficulty in access to health services and difficulties in ADLs and IADLs in any of the samples.

In this study, being underweight and overweight had a positive and independent association with limitations for ADLs among rural long-lived, corroborating results in the literature.[33,34] In a longitudinal study involving seniors from Singapore, it was found that seniors with obesity had 6.3 more years with functional limitations for ADLs and IADLs compared to those with normal weight, while those with pre-obesity had 3.7 years longer with functional limitations for ADLs and IADLs.[35] Evaluation of factors limiting FC in long-lived persons may direct care actions in the prevention and rehabilitation of limitations and disabilities.[36]

This study presents limitations resulting from cross-sectional studies, because, although there were observed associations between FC and the variables under examination, it is not possible to discern temporal relationships between them. In addition, self-reported data were used and the help of a substitute informant for the seniors with cognitive decline may have contributed to generate bias due to failures resulting from this type of information. However, such limitations do not compromise the results of this study, since the methodological procedures used were enough to achieve the proposed objective.

Conclusion

Socioeconomic and demographic inequalities in Brazil can influence FC in seniors aged 80 years and older. Among urban long-lived, income was independently associated with the development of difficulties for IADLs. Financial constraints may favor the development of functional limitations among the oldest old from large urban centers. In a rural community where there is little variability in such conditions as seniors are mostly poor and illiterate, inadequate weight, stroke, and joint disease were independently associated with limitations for ADLs, while chronic diseases were associated with difficulties for IADLs.

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Author Contributions

JCLN, TNM, YAOD and SS: study conception, study design, acquisition of data, analysis, interpretation of data, and drafting the manuscript. ALB; JLFS: analysis and interpretation of data. JCLN, JBM, TTMS, SAVA, JMMS, JLGSF, JMMS, RFMS: acquisition of data. MS, MW and MZ: revision of the manuscript. All authors read and approved the final manuscript.

Declaration of Conflicting Interests

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Ethical Approval and Consent to Participate

This research was approved by the Research Ethics Committee of Paraiba State University (UEPB) under protocol CAAE: 67426017.6.0000.5187 and University of São Paulo (http://www.fsp.usp.br/sabe/), being in accordance with the principles of Resolution 466/12 of the Brazilian National Health Council. All participants or their guardians received verbal and written explanations regarding the study procedures, and when they agreed, they signed the informed consent form and institutional declaration of approval. The results were presented to the participants after the conclusion of the study.

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Availability of Data and Material

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Supplemental Material

Supplemental material for this article is available online.

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